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The Impact of Timber Harvesting on Nonpoint Source Pollution, 1999

Maine Department of Conservation

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THE IMPACT OF TIMBER HARVESTING ON NONPOINT SOURCE POLLUTION

Report to the 119th Maine Legislature
Joint Standing Committee on Agriculture, Conservation and Forestry

Prepared by:
Maine Department of Conservation
Maine Forest Service
15 January 1999

Table of Contents

[Introduction](#)

[Process](#)

[Acknowledgments](#)

[Statewide Standards](#)

- [Introduction](#)
- [Recommendations](#)
- [Section I. Applicable Areas](#)
- [Section II. Standards](#)
- [Section III. Other Issues](#)

[Monitoring BMP Utilization](#)

- [Purpose](#)
- [BMP Assessment and Monitoring](#)
- [Specific Goals of BMP monitoring](#)
- [Effectiveness of BMPs](#)
- [In-stream Monitoring and Analysis](#)

Introduction

The following report is submitted in fulfillment of the legislative directive provided in PL 648 as passed by the 118th Legislature. This law directed that "...the Maine Forest Service, in consultation with the Maine Land Use Regulation Commission and the Department of Environmental Protection, shall develop a report with recommendations for a set of statewide standards to minimize the impact of timber harvesting on nonpoint source pollution." The legislation also directed the Maine Forest Service (MFS) to: (1) evaluate the progress made by timber harvesting operations in implementing Best Management Practices (BMPs); and, (2) to make a recommendation regarding the use of compliance with BMPs as a determinant of enforcement proceedings. Finally, the legislation directed that MFS submit the report to the Land and Water Resources Council (LWRC) for review.

Process

Following passage of the legislation, MFS mobilized an existing technical working group known as FORAT (Forestry Advisory Team) to advise and assist it in addressing its legislative directives. MFS co-chairs FORAT in collaboration with the Department of Environmental Protection (DEP). FORAT has over 60 individuals on its mailing list; its meetings typically are attended by 15 to 25 people. The group consists of landowners, representatives of statewide conservation groups and the forest products industry, scientists (primarily from the University), staff from MFS, DEP, Land Use Regulation Commission (LURC), State Planning Office and Department of Inland Fisheries and Wildlife. FORAT met several times between July and December, 1998 to provide advice on how to address the various issues and to react to draft proposals developed by staff. The USDA Forest Service, State and Private Forestry provided meeting facilitation services. It is important to note that FORAT serves an advisory role to MFS and DEP. Although consensus is a desirable goal, it was not sought in the development of this report. FORAT reviewed earlier drafts of the work that comprises this report, and the group appeared to have reached a general agreement on the desirability of statewide timber harvesting standards and on the proposed approach to BMP implementation monitoring; however, it has not reviewed or endorsed this report.

An nearly final draft of this report was presented to the Land and Water Resources Council on 11 January, 1999. The council tabled its full consideration of the report but supported MFS presenting it to the Legislature at this time.

Acknowledgments

The Maine Forest Service thanks FORAT for its valuable contributions to this report. An important core group of individuals attended every meeting, and these people provided insightful and critical guidance as the process evolved. We also thank Mark Miller of Two Trees Forestry for allowing us to test the BMP monitoring form on

a harvest conducted by his firm. We appreciate the facilitation services provided by Mary Chapman and Joe Michaels of the USDA Forest Service, State and Private Forestry. Finally, we would like to thank the state staffers who did yeoman's work in developing and refining the proposals made in this report: Roger Ryder (MFS), William Galbraith (LURC), and Dan Prichard (DEP).

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Statewide Standards

Introduction

The proposed statewide timber harvesting standards for riparian areas were prepared by LURC and DEP staff, in consultation with MFS and FORAT. In developing these recommendations, staff explored numerous options for expanding the areas where the standards would be applicable, for providing additional protection to small streams and for modifying the standards to ensure that they provide the protection intended and were clear and measurable. In the end, we returned to the directive given by the Legislature, which was to use the current LURC standards as the basis for statewide standards, and one of the recommendations of the Maine Council on Sustainable Forest Management's 1996 report ("Sustaining Maine's Forests: Criteria, Goals, and Benchmarks for Sustainable Forest Management", July 1996), which recommended that a uniform set of statewide timber harvesting standards be no less stringent than the current LURC and DEP standards combined. For the most part, where the LURC and DEP Shoreland Zoning rules were consistent, the existing standard has been retained.

Areas where harvesting limitations would apply are defined by their spatial relationship to mapped water bodies and wetlands, based on a classification of the water body by size (stream order) and type (great pond, stream, wetland). This modification provides additional measurable harvesting restrictions adjacent to smaller streams that previously had only minimal or no protection.

Recommendations

1. The MFS should initiate rulemaking under the Forest Practices Act (FPA) to adopt new statewide standards developed in cooperation with LURC and DEP. Those rules when adopted would be administered and enforced by MFS.
2. LURC, Natural Resources Protection Act, and Shoreland Zoning statutes should be amended to exempt forestry activities in riparian zones if conducted in accordance with new FPA statewide standards.¹ That effort may necessarily be extended to further address forest sustainability benchmarks to be developed as directed in PL Chapter 720 as passed by the 118th Legislature or as better scientific information becomes available.
3. The proposed uniform timber harvesting standards:
 - are based on current LURC and DEP shoreland zoning rules;
 - add or extend forested buffers adjacent to mapped first and second order streams;
 - establish an unscarified filter strip adjacent to all designated water bodies and wetlands, including unmapped streams;
 - establish consistent standards for land management roads and skid trails using LURC standards, with the exception that land management roads, skid trails, and winter roads be located outside forested buffer (100/75/25 feet depending on water body); and,

- adopt one "stream" definition statewide using current LURC definition.

Section I. Applicable Areas. The requirements listed in Section II below apply to timber harvesting activities within the following areas:

- A. Within 250 feet of tidal waters and coastal wetlands, great ponds, rivers below the 25 square mile drainage point, and non-forested freshwater wetlands 10 acres or greater in size and rated by the Maine Department of Inland Fisheries and Wildlife as having moderate or high value for waterfowl habitat.
- B. Within 75 feet of second order and larger perennial streams, as identified on 7.5 minute series USGS topographic maps, non-forested freshwater wetlands 10 acres or greater in size and rated by the Maine Department of Inland Fisheries and Wildlife as having low or indeterminate value for waterfowl habitat, and any stream or portion of a stream located within 250 feet of the applicable area defined in paragraph #IA above.
- C. Within 25 feet of all other mapped perennial and intermittent streams, as identified on 7.5-minute series topographic maps, except as otherwise identified above.
- D. Adjacent to all other streams (includes unmapped streams), and all water bodies and wetlands listed above, an unscarified filter strip of variable width as identified in Table 1 below, must be maintained.

Section II. Standards.

- A. Within areas identified in paragraphs IA, IB, & IC above, up to 40% of the volume of trees 4 ½ inches in diameter, measured at 4 ½ feet above ground level (dbh), in any 10 year period may be selectively removed, provided a well-distributed stand of trees and other vegetation is maintained, including existing ground cover vegetation. Within this area, there shall be no cleared openings to the water body or wetland (For the purposes of these standards, basal area would be considered equivalent to volume).
- B. Within areas identified in paragraph IA above, at distances greater than 100 feet from a great pond and 75 feet of the other water bodies and wetlands, cleared openings in the forest canopy would be limited to a maximum of 10,000 sq. ft., with any single clearings greater than 5,000 sq. ft. required to be separated by a minimum of 100 feet.
- C. For all areas identified in Paragraph I above, where the operation of machinery results in exposed mineral soils, the operation would be required to maintain an unscarified filter strip between the exposed mineral soil and the water body or wetland, according to Table 1 below (taken from the LURC standards).
- D. Within areas identified in Paragraph IA, IB, and IC above, except for approaches to water crossings, land management roads, skid roads and trails shall be located at least 100 feet from great ponds, and 75 feet from other water bodies and wetlands, and 25 feet from mapped first order perennial and intermittent streams. On slopes greater than ten percent (10%), the road, skid road or skid trail shall be set back an additional ten feet for each five percent (5%) increase in slope above ten percent (10%).

Table 1

%	WIDTH OF	%	WIDTH OF	%	WIDTH OF
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SLOPE	FILTER STRIP	SLOPE	FILTER STRIP	SLOPE	FILTER STRIP
0	25 ft.	30	85 ft.	60	145 ft.
10	45 ft.	40	105 ft.	70	165 ft.
20	65 ft.	50	125 ft.		

Above standards apply to areas sloping toward the water body or wetland. For areas sloping away from the water body or wetland (reverse slope) a minimum filter strip of 25 feet must be maintained.

E. No accumulation of slash shall be left below then normal high water line of any mapped stream or water body, or within fifty (50) feet of the normal high water line of water bodies identified in paragraphs IA and IB above. Beyond fifty feet of those water bodies identified in paragraphs IA and IB above, slash shall either be removed or disposed of in a manner such that no part thereof extends more than four (4) feet above the ground.

F. Timber harvesting equipment, including skidders, shall not utilize stream channels as travel routes, except when surface waters are frozen and the activity will not result in any ground disturbance.

G. All crossings of flowing water shall require a bridge or culvert, installed in compliance with the standards and permit requirements of the administering agency; except that on streams above the 25 square mile drainage point, which have low firm banks and channel beds that are composed of gravel, rock or similar hard bottom surface that would not be eroded or otherwise damaged, crossings may be allowed without a bridge or culvert, provided they are conducted in a manner that does not cause damage to the stream bank or erosion or sedimentation to the water body.

H. Skid trail and skid road approaches to stream channels shall be located and designed so as to divert water runoff from the trail or road into an unscarified filter strip to prevent such runoff from directly entering the stream. A diagram on the last page of this report illustrates some of the proposed changes.

Section III. Other Issues The above standards, if acceptable, need to be refined to further clarify the following:

A. Streams: Recommend using existing LURC definition of "stream channel" to identify what constitutes a stream. "A channel between defined banks created by the action of surface water and characterized by a lack of terrestrial vegetation or by the presence of a bed, devoid of topsoil, containing waterborne deposits or exposed parent soil, or bedrock."

B. In addition to the above timber harvesting and buffer standards, uniform statewide standards for land management roads and water crossings, consistent with current LURC road and water crossing standards (Section 10.17,A,4 of the Commission's "Land Use Districts and Standards") should be adopted, with the following exception: Except for approaches to water crossings, land management roads should be set back a minimum of 100 feet from great ponds, 75 feet from other mapped water bodies and wetlands as identified in paragraph IB above, and 25 feet from all other streams, where the slope of the land between exposed mineral soil and the water body is less than 10%. The minimum setback distance for roads shall be increased by ten (10) feet for each five percent (5%) increase in slope above ten percent (10%).

C. As noted above, the current LURC requirements for water crossings and unscarified filter strips would apply to all streams which have a stream channel as per the LURC definition, and timber harvesting limitations and vegetative buffer strip requirements would be applied as per the above standards in the newly defined applicable areas. The provisions of Section 10.17,A,5,g, of LURC's Land Use Districts and Standards, which allows for operation not in strict compliance with the standards along streams that drain less than 300 acres, would be eliminated.

D. Municipal Code Enforcement Officers should continue to play a role in enforcement where the municipality has indicated such a desire. The MFS should notify municipalities of timber harvesting enforcement activities in the shoreland zone as a matter of policy and practice.

Monitoring BMP Utilization

Purpose

1. To assess BMP utilization related to timber harvesting. Present and future assessments will be structured to allow the 1996 report *"Assessing Compliance with BMP's on Harvested Sites in Maine"* ("Briggs Report") to be used as an initial base line for comparisons. Results will be used to enhance and focus the educational efforts to improve voluntary utilization of BMPs.
2. To assess how effective BMPs are at controlling sedimentation, protecting filter strip integrity and maintaining shade in adjacent water bodies. The "Briggs Report" found that effectively implemented forestry BMPs can minimize the impact of timber harvesting on water quality. The report identified three areas that require more investigation in order to improve BMPs: (1) skidder stream crossings; (2) water flow control in and around a road structure; and, (3) shading of small head water streams. To understand the potential impact of these three concerns, water quality monitoring in a more general way must also be studied. Setting a baseline for in-stream monitoring for water temperature, chemistry, biotics and sediment load is the first step. The monitoring approach is focused towards establishing a natural background base line, then monitoring for specific attributes for specific durations. Acceptable ranges and acceptable durations in each range will then be established. This approach is similar to air quality monitoring where air quality is monitored for specific attributes for specified durations.

BMP Assessment and Monitoring Not all BMPs are specifically addressed. BMPs that were identified by the "Briggs Report" and FORAT members as having the greatest impact and potential for sedimentation have the highest priority to be assessed for initial monitoring. All high priority BMPs have been classed into six categories based on assessment, commonality and ease of sampling. Categories for active and inactive sites are:

1. Skid trail channeling of water;
2. Filter strip integrity;
3. Filter strip shade requirements;
4. Skidder stream crossings;
5. Haul road stream crossings; and,
6. Water discharge of haul road drainage system.

This approach allows for future changes in the monitoring process since the focus is results oriented versus analysis of use of each BMP (each BMP is a tool utilized to obtain a desired end result). The use of tools may improve or new tools may be added with out jeopardizing the initial baseline created. The following water bodies

will be used for the monitoring process: ponds, lakes, rivers, perennial streams, perennial brooks and intermittent streams. This will ensure consistency of terminology state wide.

Population to sample

- Use MFS notification system as the population.
- Randomly draw 2 active notification numbers for each MFS ranger district (9 districts) on a monthly basis which will then be sampled (216 samples per year).
- Randomly draw 1 inactive notification number for each MFS ranger district on a monthly basis, which will then be sampled (108 samples per year).

Sampling

1. Samples to be drawn by MFS Planning staff.
2. Field work to be conducted by MFS foresters in collaboration with MFS rangers (district assessment team).
3. A standardized report form will be used.
4. Field foresters to be trained in sampling procedures to ensure consistency and continuity.
5. Each district assessment team will be accompanied by a quality control team once a year. The quality control team consists of 1 DEP, 1 LURC, 1 MFS, 1 industrial and 2 non-industrial landowner representatives.
6. Reports will be turned into MFS Planning staff during the month the sample was drawn.

Trial run of sampling method The site monitoring form has been field tested and edited to ensure desired questions pertaining to BMPs are answered.

Specific Goals of BMP monitoring

Active and Inactive Harvesting Site Analysis MFS will be responsible for data analysis. Analysis will be conducted using standard statistical methods. The analysis goal is to determine the following:

Active and Inactive sites

- Percentage of timber harvest operations that utilized BMPs.
- Percentage of harvest operations that had a water body in the harvest area.
- Percentage of timber harvest operations that resulted in sedimentation into water bodies and rate the categories relative to frequency.
- Percentage of timber harvest operations that resulted in sedimentation into filter strips from harvesting.
- Percentage of timber harvest operations that controlled skid trail channeling of water flow away from road drainage system, filter strips and water bodies.
- Percentage of timber harvest operations that maintained the integrity of the forest floor in the filter strip from harvesting.
- Percentage of timber harvest operations that met minimum shade requirements in filter strips.
- Percentage of timber harvest operations that utilized a skidder stream crossing.
- Percentage of timber harvest operations that utilized a skidder stream crossing structure.
- Percentage of active timber harvest operations that utilized a haul road stream crossing.
- Percentage of timber harvest operations that did not discharge road drainage water into a filter strip or

water body.

The above questions may also be analyzed by landowner class, type of harvest and average slope of site adjacent to filter strip.

Effectiveness of BMPs.

Sampling

MFS, in association with the University of Maine or a similar party, will be responsible for in stream monitoring. Monitoring will be for the purpose of collecting data for temperature, dissolved oxygen, pH, conductivity, phosphorus, sediment loads, biotics and water flow velocity in headwater streams. Monitoring will focused towards establishing natural background base lines and the effectiveness of BMP's. Portable in-stream monitors are recommended as the monitoring devices.

A minimum of two years of baseline data is essential for comparison of results from monitoring harvest operations. The two-year baseline data should be collected in small perennial streams in various watersheds. Watersheds selected are: West Branch of the Penobscot River, Kennebec River, Saco River and Machias River. Monitors should be placed in a headwater where there is no plan for harvesting for a two-year period.

The actual number of harvest sites to be monitored annually will be a function of cost and duration of a sampled harvest. Since this is a large undertaking, a grant proposal may be warranted. This item requires in-depth discussions with the entities which will conduct the in-stream monitoring.

Typical cost of monitoring The total cost of purchasing a monitor, maintaining the monitor and collecting data is approximately \$15,000.00 per year. Each site monitored would require a minimum of four monitors which translates to \$60,000.00 per site annually. Starting with four sites for background data collection the annual cost would be \$240,000.00. Once the background watershed sites are established for two years, monitoring would commence on harvesting operations. This translates to \$480,000.00 per year for water quality monitoring to assess the effectiveness of BMPs on harvest operations for a two-year period. A minimum of a four year commitment would be required to obtain desired information. Total expenditure for BMP effectiveness study is \$1,440,000.00 over a four-year period.

A second option for studying the effectiveness of BMPs is a more narrow "case" approach. Case studies are more focused towards a specific site and the results should not be used or extrapolated to the entire state. Case studies would only answer questions related to sites with similar attributes and situations. The cost is much less but the results are also less reliable for state wide assessment. Case studies for BMP effectiveness could be accomplished for \$360,000.00 over a two-year period.

In-stream Monitoring and Analysis. The purpose of in-stream monitoring and analysis is to monitor trends in the impact of timber harvesting operations on sediment delivered to water bodies and changes in water temperature. The goal is to determine the following:

- Percentage difference in sediment loading below the site compared to sediment loading above the site for the duration of operation;
- Sediment load and duration of the sediment load below site sample compared to above site sample;
- Range and average sediment loading above and below the harvest sites;

- Average water temperature above and below the site. The temperature can then be used along with measured dissolved oxygen to determine the percent oxygen saturation which is a standard means of assessment for Maine's rivers and streams;
- Average dissolved oxygen above and below the site;
- Average stream velocity. Sediment loading and duration of load can be stratified for different stream velocities;
- Comparison of above and below site measurements for pH, conductivity and phosphorus;
- Comparison of monitoring results with the initial two-year base line data in the four selected watersheds; and,
- Sampling of biotics prior to harvest and after harvest as well as above and below the harvest site. Post harvest sampling would continue for one year.

Reporting Reporting will be done on an annual basis in alignment with other MFS reporting schedules. A general report would be informative and understandable by the general public, not presented as a research report. All back up technical data will be reported in the appendix for individuals that desire a more technical reporting format. FORAT members will have the opportunity to review the report and comment prior to general release. FORAT will use the report to assess the need for changes or additions in content collected and assist in identifying critical educational topics.

BMP Implementation as a Determinant of Enforcement Proceedings

MFS staff consulted with Vermont Agency of Natural Resources (ANR) staff, a representative of the Vermont Forest Products Association (VFPA), DEP and LURC staff regarding agency enforcement policies with respect to forestry-related violations of water quality laws and rules. Vermont's approach can be summarized as follows:

- Vermont statute (10 VSA §1259-f) exempts timber harvesting operations that use "Acceptable Management Practices" (what we call BMPs) from water quality discharge permitting requirements. Acceptable Management Practices for forest management are defined and published by the ANR.
- If a discharge of sediment to state waters occurs from a timber harvesting operation, a team that includes an ANR enforcement officer, an ANR forester, and a representative of the VFPA visits the site. If a discharge is verified, the team makes recommendations for the landowner or logger to remediate the site. The recommendations are specific about who should do what, where, and by when. The team then revisits the site at some future point to document remediation.
- If the discharge is significant, if remediation efforts fail, or if the discharge is a repeat event, ANR enforcement staff have the discretion to proceed with enforcement action. The operative word is discharge. If there is no discharge of sediment to public waters, there is no violation.
- The impression of ANR staff is that the program works. They know that BMP utilization is not 100%, but the number of violations appears to be relatively low.
- VFPA believes that the process works, but it has concerns about whether the enforcement efforts have become more aggressive in recent years, and about the personal costs to the loggers who participate on review teams. VFPA encouraged Maine to involve Maine's forest industry in the team approach, and to identify adequate resources to do the job right.
- A quick summary of an audit of BMP implementation done in Vermont in 1996 is as follows:²

BMP's work when they are implemented effectively.

BMP implementation is not where the state would like it to be; however, most of the problems documented did not result in sediment discharge to public waters, although some resulted in local erosion.

The biggest problem found was in stream crossings.

Consultation with DEP and LURC staff revealed that both agencies take a similar approach to Vermont's, in practice if not in explicit policy. Both agencies (and MFS, in its Forest Practices Act enforcement) take a tiered approach to enforcement that ranges from intervention to remediation to negotiating settlement agreements to court action. The focus is on working with landowners and managers to prevent violations from occurring. The key differences between Vermont and Maine are that the BMP exemption is explicitly written into statute and that Vermont's remediation team includes a representative of the forest products industry. Given that BMP utilization is recognized by both agencies in compliance and enforcement proceedings and that the responsibility for regulatory oversight of timber harvesting and water quality issues may change as a result of this report,

MFS recommends no change at this time in statute or agency policy.

Footnotes

1 The exemption would not apply to other LURC protection districts (e.g., high mountain areas) and non-riparian resources protected under NRPA. This would be clarified in rule.

2 These findings are consistent with that of FORAT following the "Briggs Study."